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THE INITIAL TENDENCY IN IDEAL REVIVAL.

By FELIX ARNOLD, PH. D.

The question concerning the direction in which the tendency towards reproduction in memory realizes itself, has received rather scant attention, the general opinion being that memory runs in a forward and not in a backward direction. This idea of serial revival is, moreover, closely connected with an atomistic conception of consciousness, which conception has greatly influenced discussion and experiment in this connection. Now the atomistic conception of consciousness, that, because ideas are revived in a series, therefore, they exist serially in consciousness, has greatly influenced the various points of view when the question of the direction of revival in memory has been in question. I have collected a number of data with the sole purpose of determining this order of revival, and have attempted to infer certain conditions which, it seems to me, must exist, if the kind of revival occurring is to be explained. Before, however, presenting my small contribution in this connection, I have thought it advisable to present the atomistic views so ably given by Hartley and Herbart (two mountain peaks among early psychologists), and also the more modern work done by Ebbinghaus, Müller and Schumann and Müller and Pilzecker, on the problem of the '*initiale Reproduktionstendenz*.'

I.

Though Hartley may be considered as the founder of English associationist psychology, and somewhat 'out of date,' still in certain parts of his remarkable work, he offers us the closest kind of psychological analysis. His cerebral explanations are somewhat old-fashioned and impossible from a purely physiological point of view, and one who reads his *Observations* may tend to the belief that the psychological analyses are equally infirm and old. As far as I am concerned with Hartley at present, I shall only give his reasons for the existence of a forward and not a backward revival in memory.

As every one knows, Hartley tries to explain all manner of mental connection, development and growth, by association. In any serial revival this same principle is called in to show

why the direction is always forward, the explanation being given in cerebral terms. Any series of impressions

A, B, C, \dots etc.

will give rise to the succession of ideas.

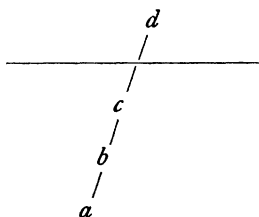
a, b, c, \dots etc.

and in the same order. For, "the successive impressions of A and B sufficiently repeated, will so alter the medullary substance, as that when A is impressed alone, its latter part shall not be such as the sole impression of A requires, but lean towards B , and end in b at last. But B will not excite a in a retrograde manner, since, by supposition, the latter part of B was not modified and altered by A , but by some other vibration, such as C or D . And as B , by being followed by C , may at last raise c , so b , when raised by A , in the method here proposed, may be also sufficient to raise c It seems also, that the influence of A may, in some degree, reach through B to C ; so that A of itself may have some effect to raise c , as well as by means of b . However, it is evident that this chain must break off, at last, in long successions, and that sooner or later, according to the number and vigor of the repeated impressions." ¹ This is a cerebral explanation of forward succession, and has in it the implication of the doctrine of relativity. It also presents for the first time the question of 'mediate' association.

A similar conclusion concerning the direction of mental revival is reached by Herbart. In any series of ideas,

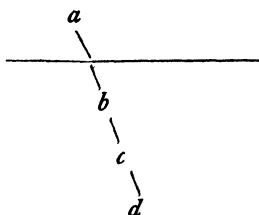
a, b, c, d, \dots etc.

as a is followed by b it is closer to b than to c which forces b below the threshold of consciousness, as b forces a below. And so on with the rest of the series. Graphically represented, when d is in consciousness, the other ideas are in the following position, their position from one another indicating the closeness of the connection :



¹ *Observations on Man*, I, 69.

When, by removal of the pressure from other ideas, or because of reinforcement, *a* has once more a chance to emerge, it does so in the manner represented below, dragging with it in order, those most closely connected with it :



“But the series never runs backward.”¹ The order of succession followed in presentation is preserved in revival.

It is evident that with this atomistic conception of consciousness, no other view of revival is possible. Given a series of ideas, *a*, *b*, *c*, *d*, etc. *b* follows *a*, *c* follows *b*, and so on. Any initial tendency is impossible. How on earth could any connection from *d* back to *a* be possible without a hop, skip and jump which even Herbart's *Mechanik* could hardly stand. In such a series, *d* must be followed by *e* if there is to be order and harmony in our mental universe. At least, so say these psychologists. I do not, at present, wish to stand for any special kind of revival. But it seems to me that this serial revival has led to a wrong conception of the present moment of consciousness. The revival of our ideas in serial order does not necessitate our consciousness being a filled cabinet, out of which the ideas drop, one by one, any more than the spinning of the threads by a spider presupposes two spools of silk rolled up in the spinnerets. I shall return to this point after I have presented my data in Part II.

Ebbinghaus pursues a different method in his investigation of memory, in the course of which he touches upon the direction of mental succession in ideal revival. While Ebbinghaus does not establish the existence of an actual succession in a backward direction, still he tries to show that there is a connection between two syllables learned which facilitates the process of remembering when the same series is learned in the reverse order. Thus, after having learned a series in the order,

$I_1, I_2, I_3, \dots, I_{15}, I_{16}.$

more time was saved when learning the series in the order,

$I_{16}, I_{15}, I_{14}, \dots, I_2, I_1.$

¹ *Text-book*, p. 23 (tr. by M. K. Smith).

than when learned in a mixed order, thus :

$$I_{16}, I_{14}, I_{12}, \dots I_4, I_2, I_{15}, I_{13}, \dots I_3, I_1.$$

Since, in the second series 12.4% was saved in the time required for learning the series, while only 5% was saved in the time for learning the third series, Ebbinghaus concludes "that in the learning of a series, certain connections between the members is formed in a backward as well as in a forward direction."¹

Against this, Müller and Schumann give with approval the criticism of Münsterberg to the effect that when we learn a series of syllables, the visual field is not restricted to a single syllable, and unconsciously, in glancing at the syllables, we form such backward associations as will account for the difference in the saving of time given by Ebbinghaus. Müller and Schumann avoided this difficulty by presenting the syllables in isolation, thus minimizing the visual concomitance. They come, however, to a similar conclusion. The syllables were learned in trochaic measure. The above mentioned investigators found that, of two syllables belonging to the same foot, the second one tended to revive the first.² They also concluded that in such cases we may explain the direction of succession not only as a backward one, but also as a tendency to revive the whole complex in its original serial order.³ This gives us the first indication of any 'initial' tendency in ideal revival.

Now it is evident that with a trochaic measure, the question is still undecided as to whether such revival is backward or initial. In another series of experiments, Müller and Pilzecker presented evidence in favor of the latter tendency. Instead of using a trochaic beat, they used the anapestic foot. With three syllables, revival of the second upon presentation of the third, would help fasten the belief in a backward association, while revival of the first would increase our belief in an initial tendency in mental reproduction. The results of their experiments were in favor of the initial tendency.⁴

II.

In the series of tests given by the above mentioned investigators on the question of the initial tendency in serial revival, it seems to me conditions are, in this special case, somewhat artificial. In the first place, we do not, in the natural order of events, speak in nonsense syllables, with the accent on each

¹ *Ueber das Gedächtnis*, § 40.

² *Zeit. f. Psych.* 6: 163.

³ *Ibid.*, 6: 309.

⁴ *Ibid.*, *Ergänz. Band.* I, Ch. VI.

odd or third one. Again, any possible connection and development of the serial meaning in each member is reduced almost to a minimum, and there remains in the series the tendency of the members to exist as discrete and separate units. Of course any rhythm or body attitude taken towards each member in the series would tend to give them a serial unity, and thus would tend to give them serial meaning in greater or less degree. Finally, it is rather difficult to obtain a pure series of syllables, *i. e.*, a set of syllables without any previous connections. In the various connections of syllables, it is possible that a syllable which precedes in the artificial series, may have been previously associated in the common course of events, as a succeeding syllable. It is necessary to have nonsense syllables if we use them as did Ebbinghaus and the others for the purpose of determining gain of time, etc., when learning them in different orders. But I think it hardly necessary to use nonsense syllables to determine whether the memory runs in a forward or a backward direction, or whether there exists an initial tendency or not. I may, of course, be wrong, but I think that if we wish to find out how a person remembers, we need but simply give him a cue, and see what comes into his mind after such cue, restrictions being placed as to the topic remembered. The natural order of mental succession can then be noted. Care, however, must be taken to get the very first ideas arising upon presentation of the cue, and precautions must also be taken to deal only with what is thoroughly known and is easy of recall. Where there is a halting process, I venture to suggest that this is not memory proper, but a species of perception mixed with memory. When a person has to struggle to get the next word in a series, each word, as it is dragged out, acts as a new stimulus, as an actual impression influencing further revival. In pure memory, the process ought to go off upon presentation of the stimulus alone. It ought to be more or less automatic.

In collecting the data to determine the presence or absence of an initial tendency, I tested a class of boys in the sixth year (second half), about forty in number, averaging 12 years 5 months, the ages varying from 10 years 5 months to 15 years 5 months. The selection which I used was a poem which they had already memorized for regular recitation purposes, and which they 'knew' fluently. In the first five tests given below, I selected parts of this poem, no emphasis being placed upon the rhythm, the natural rhythm alone operating. The boys did not know the object of the test. I emphasized the following points before beginning: Upon my calling out a word, they were to write down the very first words of the part chosen which came into their minds. I dwelt upon this point, and also the fact that everything they put down was correct, so

long as it was the first thing which arose, and so long as it belonged to the part of the selection chosen for the purposes of the test. In the first test I asked them to write down the first word, but in all those following, they wrote down the first three or four words arising upon presentation of the cue.

Before giving my results, it may be advisable distinctly to state the meaning of the terms used and their abbreviation. F=*fromward* tendency, *i. e.*, one going straight ahead upon presentation of the cue. For example, in the lines,

"The blessed damozel leaned out
From the gold bar of Heaven."

when given the cue, 'the,' I recalled 'the gold bar of Heaven,' such revival being *fromward* the cue, and in a *forward* direction. On the other hand, given the cue, 'leaned,' I recalled at once the series 'The blessed damozel leaned out.' This latter revival illustrates the *initial* tendency, which also goes in a *forward* direction and is designated by I. Both tendencies are in a *forward* direction, though the one is *fromward*, the other *initial*. When, in the tests given, no words were recalled, or where there was a halt due to sudden disturbance caused by the stimulus, or inability to recall, I have put the result under B or blank. In each result, I have stated the date when given, the part of the memory piece selected, the list of cues presented, the number of boys acting as subjects, and the number of cases, the last being distributed under the headings I, F, and B as above explained. Where a boy took up the cue and proceeded straight ahead, I have counted the case in the *fromward* column, and I have also put in the same column those cases in which revival immediately follows the cue, and in which there is an apparent 'skip' ahead of the cue before revival occurs. Certain possible objections to my method of procedure I shall take up after having presented my results.

TEST I.

Date. March 20, 1905 (forenoon).

Part selected.

"By the flow of the inland river."

Cues. *flow, inland, river, the.*

Number of boys. 38.

Cases.	I.	F.	B.	total.
	86	65	1	152

TEST II.

Date. March 20, 1905 (afternoon).

Part selected.

"No more shall the war cry sever,
Or the winding rivers be red."

Cues. *sever, winding, rivers, shall.*

Number of boys. 40.

Cases.	I.	F.	B.	total.
	104	55	1	160

TEST III.

Date. March 27, 1905 (afternoon).

Part selected.

"By the flow of the inland river,
Whence the fleets of iron have fled,
Where the blades of the grave grass quiver,
Asleep are the ranks of the dead,—
Under the sod and the dew,
Waiting the judgment day:
Under the one, the Blue,
Under the other, the Gray."

Cues. *fleets, dew, day, flow, under.*

Number of boys. 42.

Cases.	I.	F.	B.	total.
	128	78	4	210

TEST IV.

Date. April 3, 1905 (afternoon).

Part selected, same as in test III.

Cues. *of, blades, asleep, under, the, of.*

Number of boys. 40.

Cases.	I.	F.	B.	total.
	56	182	2	240

It is interesting to note that in cues 1 and 6 (*of*) which are the same, a different series was revived for each in the cases of 25 boys, and that of these 25 boys, 10 differed in that one revival was fromward, while the other (for the same cue), was initial. The other 15 boys revived an entirely different series in the two cases for the same cue.

TEST V.

Date. April 10 (afternoon).

Part selected,

"Sadly, but not with upbraiding,
The generous deed was done:
In the storm of the years that are fading
No braver battle was won,—
Under the sod and the dew,
Waiting the judgment day:
Under the blossoms, the Blue;
Under the garlands, the Gray."

Cues. *in, sod, fading, years, not, under, day, the, under, braver.*

Number of boys. 39.

Cases.	I.	F.	B.	total.
	120	269	1	390

In this test 14 boys revived, for the same cue (*under*), a different series in each case, *i. e.*, the same boy for the same cue gave a series differing in the second revival upon presentation of the cue.

In the following set of tests, about half the boys were the same as those acting as subjects in the preceding experiments. The class numbered about forty, was in the seventh year (first half), and averaged 12 years 3 months, the ages varying from 11 years 0 months to 15 years 9 months. Similar explanations were given as in the above tests.

TEST VI.

Date. October 16, 1905 (afternoon).

Part selected.

"Whither, 'midst falling dew,
While glow the heavens with the last steps of day,
Far, through their rosy depths, dost thou pursue
Thy solitary way?"

Cues. *glow, steps, way, with, the.*

Number of boys. 41.

Cases.	I.	F.	B.	total.
	64	133	8	205

The 8 blanks were all caused by the cue 'way,' which, it may be noted, is the last word in the stanza chosen. These eight cases might perhaps be classed under F, since the blank may have been caused by a natural inability to proceed onward.

TEST VII.

Date. October 24, 1905 (afternoon).

Part selected.

"I chatter, chatter, as I flow
To join the brimming river,
For men may come and men may go,
But I go on for ever."

Cues. *flow, river, men, I, forever.*

Number of boys. 36.

Cases.	I.	F.	B.	total.
	84	89	7	180

Similar to the cases in test VI, the seven blanks were caused by the cue 'forever' which is the last word in the stanza.

TEST VIII.

Date. October 25, 1905 (afternoon).

Part selected.

"The quality of mercy is not strain'd,
It droppeth as the gentle rain from heaven
Upon the place beneath: it is twice bless'd:
It blesseth him that gives and him that takes."

Cues. *quality, it, gentle, blesseth, the.*

Number of boys, 39,

Cases.	I.	F.	B.	total.
	19	170	6	195

The blank cases were caused by the cue 'the.' I infer from this that lack of revival was due to conflict, to shock due to the number of series which have equal right to follow 'the' and which would strive so to do.

TEST IX.

Date. October 26, 1905 (forenoon).

Part selected.

"We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness."

Cues. *truths, created, men, that, these.*

Number of boys. 37.

Cases.	I.	F.	B.	total.
	44	141	0	185

Before analyzing the above results, I think it advisable to answer a possible objection which may be raised. Since the selections were learned for purposes of class recitation, did not the boys therefore tend to recite the answers in the order in which they were usually required to do? Since they knew that only a certain method of recitation would be accepted, would not this influence their mode of reaction? If I wished to investigate the fromward tendency, perhaps such objection might have some weight. But the fact that a fromward direction is usually required in class recitation would operate strongly against any initial tendency becoming manifest. For a recitation proceeds onward, and not with a skip back and then ahead. The initial tendency, if shown (as it is), is strongly opposed by the artificial conditions imposed. This peculiar skip back and then the process ahead (initial tendency forward), moreover, cannot be explained by any backward revival. For if such were to operate, the intermediate words would have to be revived. This point I shall discuss more fully in the following section. Before, however, proceeding with my analysis of the results, I shall distribute the cases in Test VII, and give those examples of initial and fromward tendencies which occurred most frequently.

TEST VII.

Cue. *flow*.

I cases. 16.

'I chatter chatter as I flow'

'chatter chatter as I flow'

'as I flow'

'I flow'

F cases. 20.

'flow to join the brimming
river'

'to join the brimming river'

Cue. *river*.

I cases. 26.

'to join the brimming river'

'the brimming river'

'brimming river'

F cases 10.

'river for men may come'

'for men may come'

Cue. *men*.

I cases. 9.

'for men may come'

F cases. 27.

'men may come'

'may come'

Cue. *I*.

I cases, 4.

'but I go on'

F cases. 32.

'I chatter chatter'

'chatter chatter as I flow'

'I go on forever'

'go on forever'

'flow to join'

Cue. *forever*.

I cases. 29.

'but I go on'

'I go on forever'

'go on forever'

B cases. 7.

It is to be noted that no attention was paid to spelling or punctuation. It is also to be noted that the last word in the answer of some of the cases (as in the cue *forever*), is the same as the cue of the following test. It is, however, interesting to note that of the seven boys that put a blank when the fifth cue was called out (*forever*), five of them had 'forever' as the last word in their answers to the fourth cue. The answers above distributed are those which predominated. In addition were cases in which there were words or even whole lines skipped in the fromward cases, such skipping being, in the usual atomistic explanations, classed as 'mediate' association. Since I wish, among other things, to show the fallacy of the atomistic conception, I shall, in the following section, try to give a different explanation.

III.

Though our ideas or conscious moments come in serial order, this fact does not necessitate the existence of any potential series in the same order as that in revival. The fact that a series of ideas, etc., arises in the order,

a, b, c, d, p.

is no proof that stored up in our 'empty cabinets' is a number of ideas, a, b, c, d , etc., which drop out, as it were, one by one. The existence of an initial tendency in mental reproduction requires a far different conception of the present moment of consciousness. When written in symbolic form, as words, etc., the series seems to presuppose a number of discrete units which seem to exist in chain-like form in consciousness. But with such a series, how account for the initial tendency? In any series, a, b, c, d , etc., a jump back from d to a or to b will neglect, apparently, the intermediate member, b , and this vaulting process, a mental gymnastic, as it were, can hardly be explained by any 'mediate' association, backwards. For the series runs on ahead, forward, and not backward. A skip from a to d *might* be due to 'mediate' association, but 'mediate' association cannot be called in to explain the apparent jump backward. I shall try to give a rational explanation of both forward and backward 'jumps,' and shall attempt to show the futility and falsity of any explanation by 'mediate' association.

Now, instead of supposing the stimulus alone to exist as a conscious moment in the subject, in the light of the facts presented, we can add the tendency to revive a series in a forward direction, which tendency I represent by n . Instead of representing the present moment by a , or b , or p , therefore, it should be represented by pn , p giving us the stimulus or that portion of it operating, and n the tendency of the present moment to pass on in serial order. But in addition, I think it safe to add another factor, or rather to point out another factor which exists in the present moment of consciousness. The portion p of the present moment exists, not *in abstracto*, but in a series; as such, besides its own meaning, besides the meaning which it has in general, it has a specific meaning due to its position in the series; its meaning becomes narrowed, as it were, because of its serial connections. Thus, in the distribution of cases (See p. 248), and also in Tests III and IV, the same cue revived different series, and in some cases with the same boys. Thus (See p. 246) I , being in different series, had a different meaning according to the series in which it was revived. In some cases the series was '*I chatter, chatter, etc.*,' in others it was, '*but I go on forever.*' This meaning, both as such and as serial, I wish to represent by m . The entire present moment may therefore be represented by

$$pmn$$

m standing for the meaning both *per se* and as modified by the series, and n for the tendency to develop the series in which the stimulus exists. Expressing the fact that pmn may be in any place in the series, and may, therefore, explicate the series at

different points, depending upon its position in the series, we have as the present moment,

$$pm_x n_y.$$

The present moment of consciousness cannot be an *isolated idea*, but is rather an entire disposition, such disposition being excited by the stimulus or cue, and having in it (1) a meaning and (2) a tendency to explicate the series implicit in it. This meaning and this tendency, moreover, have not dropped from the heavens above, but have been developed by a previous succession or successions. Such successions, instead of being represented by the discrete members,

$$a, b, c, d, \dots p.$$

may rather be symbolized by the formula,

$$an, bmn_1, cm_1n_2, dm_2n_3, \dots pm_x n_y.$$

What is revived by the cue or stimulus is not an idea, *in abstracto*, but rather an entire disposition, having a tendency to develop the series implicit in it. Now, given this present moment with its meaning and its tendency, it makes no difference what part of the series it begins to develop. It may begin the series, or it may start at some part of the series immediately following the stimulus. For the present moment in its entirety, $pm_x n_y$, is the series in summation, and as such may develop the series at any point which the attitude calls for. *There is no 'mediate' association either way.* It is only when we consider p alone that 'mediate' association may be considered. But when $pm_x n_y$ is taken as a whole, 'mediate' association must drop out, both as a problem and as a fact.

It is only this conception of the present moment of consciousness, I think, which can account for the initial tendency, and (though I mention this by the way) for the apparent 'mediate' association. When the cue is given, there is revived in the mind of the subject an entire disposition, which represents, by its meaning and its tendency, some series or part of a series which has been previously developed. This tendency in explicating the series begins at such point as is necessary fully to develop the present moment, to expand its meaning, to enable it to 'fit' in its position. Now it makes no difference, as I have said before, where the tendency becomes realized. It may operate in an initial direction forward, or in a fromward direction forward, and in the latter case it may even skip a member or a set of members in the series. Looking at the present moment from this point of view, instead of from the older atomistic standpoint, we can, I think, explain the initial tendency, and at the same time remove the problem of 'mediate'

association. There is no actual skip either way. The series, or what there is of it, is *all there*, and exists implicitly in the present moment. When we examine the series, there seems to have been some mediation, perhaps. But as a moment of conscious life, such mediation did not exist. *The mediation exists in the logical analysis of the series by an observer* and is one of the many striking examples of the psychologist's fallacy. The whole series is present, and where and how it becomes explicated depends upon how much of it is roused, how closely it is organized, how much unity exists in it, and so on.

Before closing my account, I wish to make some minor observations, both psychological and otherwise. In arranging the cases, there was forced upon me the fact that with boys of ability above the average, with boys who show care, such ability being manifest in the tests given by good memory, thoroughness of preparation, etc., in such cases, the initial tendency was more frequent than with the rest of the boys. I do not mean to say that any *general* power was shown. Only, that where care or ability had resulted in better work as far as memorizing the selection was concerned, such care and ability having already been previously manifest, this care and ability in memory was concomitant with a very evident initial tendency, whereas the poorer scholars manifested a tendency in the fromward direction. In addition, it is seen that the earlier tests show a greater number of initial cases; and in these tests the piece was much more thoroughly and longer known than in the latter tests. It is, however, hardly fair to compare these tests, since it is evident that in many cases the position of the word and its meaning would determine largely whether the tendency was to be initial or fromward. There would have to be many more cases, and exact correlation before a more stable generalization could be made. But in general I should be perfectly willing to estimate the ability or care of the boys expended in the work, by the presence of the initial tendency. A rough and tentative classification could, I think, be made. This seems, moreover, to coincide with the conception of the present moment of consciousness above expounded. For it seems natural that where special effort or ability has been put forth, the result would be to establish a more closely organized disposition, a better developed meaning, a more complete organic whole. Such disposition would tend to realize itself from the beginning, and not in piecemeal fashion. I offer this as suggestion only, and not as a valid generalization.

Finally, the above results agree with numerous empirical observations in other directions. The above tests were restricted to verbal series with meaning. But similar results may be noticed in manual work and motor adjustments. For

example, when a boy is told to correct a drawing, his tendency is to begin it again, and he shows this either by rubbing out the whole drawing, or by asking for another paper. Or, if he is building with blocks, and is not satisfied with some part, he will often throw down the whole structure and begin again. The spasm which a child exhibits when, in a rage, he tears up his paper because of some error which has been pointed out to him, should, I think, be treated as a realization of initial tendency (which has been checked perhaps by refusal), and not as a fit of the ancient Adam. So in reading, and in the other arts, the child's tendency to begin all over should not be checked, for it seems to be the natural working of his mind. Much wasted effort and much disagreeable work could be avoided if this initial tendency were properly respected. Any error made is not an error *per se*, but an error which destroys serial unity, serial meaning, and before further meaning can be developed, the whole series must, perhaps, be gone through *in toto* before progress is again possible. Hence the initial tendency. The error has no organic connection with what follows, and a new start must be made.

My tests were given to boys, and as such, these tests must be taken for what they are worth. I have found, however, that as far as I am concerned, my mind works in a similar manner. Even if what I have presented be not wholly accepted, I hope it will bring into proper light both the initial tendency and the forward tendency, and the newer conception of the present moment of consciousness.